REMARKS

Favorable reconsideration, reexamination, and allowance of the present patent application are respectfully requested in view of the foregoing amendments and the following remarks. The amendments are made to correct clerical errors in the specification, remove references to the claims, and to otherwise affect editorial and stylistic changes; no new matter has been entered.

Rejection under 35 U.S.C. § 112, second paragraph

In the Office Action, beginning at page 2, Claim 8 was rejected under 35 U.S.C. § 112, second paragraph, as reciting subject matter that allegedly is indefinite. Applicant respectfully requests reconsideration of this rejection.

Specifically, the Office Action appears to allege that the use of the term "superalloy" in the claim somehow renders the scope of the claim indefinite, because "[t]he term 'superalloy' is not defined in the specification as having any particular characteristics beyond an alloy." Applicant respectfully and strongly disagrees.

The term "superalloy" is well known to and understood by one of ordinary skill in the art. Applicant encloses herewith a copy of relevant pages of "Metals Handbook" with the definition of "superalloys" in the Glossary at page 57. According to the "Metals Handbook", superalloys are heat-resistant alloys based on nickel, iron-nickel, or cobalt, that exhibit high strength and resistance to surface degradation at elevated temperatures. This is but one of numerous, readily available documents which show that the skilled artisan is well aware of what a superalloy is.

For at least the foregoing reasons, Applicant respectfully submits that Claim 8 fully complies with 35 U.S.C. § 112, second paragraph, and therefore respectfully requests withdrawal of the rejection thereof under 35 U.S.C. § 112.

Rejection under 35 U.S.C. § 103(a)

In the Office Action, beginning at page 2, Claims 1-9 were rejected under 35 U.S.C. § 103(a), as reciting subject matters that allegedly are obvious, and therefore allegedly unpatentable, over the disclosures contained in documents as summarized in the table below:

Claims	U.S. Patent Numbers of Documents	Pages in Office Action
1	5,474,421 (Rossmann) + 5,741,119 (Heppenstall) + 4,878,810 (Evans)	2-3
2, 3, 9	*Rossmann* + *Heppenstall* + *Evans* + 3,664,766 (Rahnke)	3-4
4	*Rossmann* + *Heppenstall* + *Evans* + *Rahnke*	4-5
5, 6,	*Rossmann* + *Heppenstall* + *Evans* + 5,551,840 (Benoit *et al.*)	5
7, 8	*Rossmann* + *Heppenstall* + *Evans* + 5,008,072 (Siga *et al.*)	5-6

Applicant respectfully requests reconsideration of this rejection.

This application describes devices and methods embodying principles of the present invention. In order to combat a number of problems in the design of turbomachines, including weight of the various components and wear of blade tips, the inventors herein arrived at a simple yet powerful set of solutions. To summarize, rotor blades made of a more ductile material can be either being considerably longer than intermetallic blades in the same rotor blade row or, if the blades are of the same length, have a different tip shape (see, *e.g.*, pages 4-5 of the present specification). Therefore, the ductile blade is able to cut a groove into the abradable material of the stator, if and when the blade tip touches the stator and to absorb the frictional/wearing forces.

Claim 1 relates to an turbomachine having a combination of elements including, *inter alia*, at least two rotor blades positioned at a uniform distance from one another and made of a material more ductile than an intermetallic compound of rotor blades, the at least two rotor blades arranged in the row of blades between the intermetallic rotor blades, wherein the at least two rotor blades are either longer than the intermetallic rotor blades, or the same length as and have a different blade tip shape than the intermetallic rotor blades.

The prior art, including *Rossmann*, *Heppenstall*, *Evans*, *Rahnke*, *Benoit*, and *Siga*, fails to disclose, describe, or fairly suggest the combinations recited in the pending claims.

Rossmann discloses a turbine rotor having heavier and lighter blades alternatingly arranged around the circumference of a turbine rotor disc. The higher and lower mass (weight) of the two types of blades is achieved by making the blades of different materials. The airfoil portions have substantially the same size and the same shape (see, *e.g.*, column 2, lines 4-10 and 21-28) and, therefore, the same length. Resonance in the blade/rotor structure as well as blade

bending is thereby prevented according to *Rossmann* (see column 2, line, line 63). According to the alternatingly arranged lightweight and heavyweight blades, the lightweight blades can each be braced against the adjacent heavyweight rotor blade, in the event they are subjected to comparatively high bending stresses (see, *e.g.*, column 3, lines 8-12). The high bending stresses may be caused by the effected blade tip grazing too hard or too deeply against the casing (column 3, lines 13-14).

Heppenstall merely discloses a root attachment for a turbomachine blade and a rotor, which have different stiffnesses, *e.g.*, a root attachment for blades which may comprise a titanium aluminide alloy. *Heppenstall* is completely silent about the use of intermediate pieces made of that material.

Evans discloses turbine blades (not made of different materials) having alternating resonance frequencies. The two different resonant frequencies are achieved by profiling the tips of every other rotor blade (see Abstract, column 2, lines 65 through column 3, line 2) or by making alternating blades shorter (column 5, lines 6-12). Furthermore, the problem addressed by *Evans*' invention is different from that of the present invention, and from those of *Rossmann* and *Heppenstall*. *Evans* wants to prevent unstalled flutter of the rotor blades and self-exited vibration between adjacent rotor blades that are made of the same material (see column 2, lines 40-46, column 3, lines 14-17, and column 4, lines 27-34). Problems to which to present invention is directed include reducing overall weight of the rotor (by using blades made of intermetallic material) and preventing brittle blade fracture (by arranging at least two blades which are made of a more ductile material and either being considerable longer than the intermetallic blades or, if they are of the same length, having a different blade tip shape).

A full and fair reading of *Evans* by the skilled artisan would therefore not lead to the hypothetical combination alleged in the Office Action to be obvious. Because *Rossmann*'s adjacent blades in each row are formed of different materials, in order to deal with problems associated with blades having the same resonance frequencies, the blades already have different resonance frequencies, a fact the skilled artisan would immediately appreciatea. Thus, the problems to which *Evans* is solely directed, dealing with adjacent blades having the same

resonance frequency, are simply not present in *Rossmann*'s device, and therefore *Evans*' proposed solutions are plainly not applicable. Accordingly, there would be absolutely no motivation to the skilled artisan to look to *Evans* to solve a nonexistent problem with *Rossmann*'s blades, and therefore a *prima facie* case of obviousness has not been made out.

Rahnke adds nothing to the analysis. *Rahnke* discloses a rotor wheel with a plurality of circumferentially spaced cores constructed of a lightweight, high melting point material. *Rahnke* describes explicitly a high temperature ceramic, for example fused alumina (Al_2O_3), a porous ceramic glass material (see column 2, lines 39-40, column 3, lines 42-43), or carbon which may be impregnated with glass (see column 3, lines 44-45). In contract, the pending claims recite, *inter alia*, a combination including intermetallic compounds, a completely different material. The ceramic or carbon pieces disclosed by *Rahnke* are not compatible with metallic or intermetallic lightweight blades, such as those of *Rossmann*, because the physical properties and toughness of ceramics/carbon are completely different from those of metals/intermetallic compounds. Furthermore, *Rahnke* fails to make up for the deep deficiencies of *Evans* and *Rossmann* with respect to the claimed combinations, discussed above.

Benoit merely discloses an application of abrasive blade tips for protection of the blades themselves. *Siga* discloses a Ni-Cr material in rotor applications (disc, distance pieces, bolts; see column 2, lines 64 to column 3, lines 14), and a rotor disc (see column 7, lines 7-10, claims 5-7, and Table 4 no. 7). The turbine blades are made of a Ni-based cast alloy, not steel, because the balance of the alloy is not iron, see column 7, lines 52-62 and Table 6. Thus, neither *Benoit* nor *Siga* make up for the deficiencies of *Rossmann*, *Heppenstall*, and *Evans* with respect to the subject matters of the pending claims.

For at least the foregoing reasons, Applicant respectfully submits that the subject matters of Claims 1-9, each taken as a whole, would not have been obvious to one of ordinary skill in the art at the time of Applicant's invention, are therefore not unpatentable under 35 U.S.C. § 103(a), and therefore respectfully requests withdrawal of the rejection thereof under 35 U.S.C. § 103(a).

Conclusion

Applicant respectfully submits that the present patent application is in condition for allowance. An early indication of the allowability of this patent application is therefore respectfully solicited.

If the patent examiner believes that a telephone conference with the undersigned would expedite passage of this patent application to issue, they are invited to call on the number below.

It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. If, however, additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and the Commissioner is hereby authorized to charge fees necessitated by this paper, and to credit all refunds and overpayments, to our Deposit Account 50-2821.

Respectfully submitted,

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